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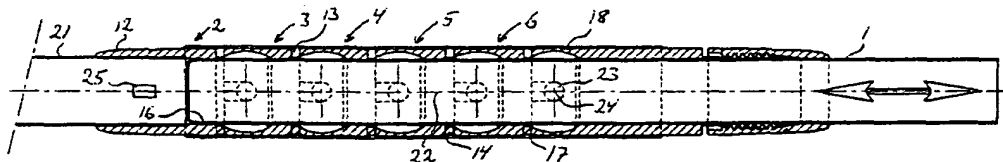
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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: FLEXIBLE JOINT



(57) Abstract: The invention relates to a flexible joint intended to connect two parts with each other, the connected parts might be rigid, of hose type or a combination thereof and are for instance of the pipe type used in vacuum cleaners, in which case the joint is intended to be placed between the rigid pipe member that is connected to the nozzle of the vacuum cleaner and the hose that is connected of the vacuum cleaner machine itself, which joint comprises: a plurality of ball joints (3-6), which co-operate with each other and which make possible for the joint to bend from a position, where the two parts and the joints that connects the two parts are essentially horizontally directed, two positions, where one of the parts (1) form an angle (α) with the other part; and a member (16) which is displaceable inside the ball joints (3-6) to different positions in relation to these, said member being able to go into engagement with and lock one or several of the ball joints (3-6). According to the invention, a flexible envelop (18) is applied on the outside of the ball joints (3-6), which envelop (18) is arranged to cover the areas between the ball joints (3-6).

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Flexible joint

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FIELD OF THE INVENTION AND PRIOR ART

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The present invention relates to a flexible joint intended to connect two parts with each other, the connected parts might be rigid, of hose type or a combination thereof and are preferably of the pipe type used in vacuum cleaners, in which case the joint is intended to be placed between the rigid pipe member that is connected to the nozzle of the vacuum cleaner and the hose that is connected to the vacuum cleaner machine itself.

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Vacuum cleaners are normally designed in the way that the hose of the vacuum cleaner at one end is connected to the vacuum cleaner machine itself and at its other end to one end of the pipe which at its other end is connected to the nozzle of the vacuum cleaner. This pipe is normally made of plastic material or a light metal material and is accordingly rigidly designed. Furthermore, the pipe has such a length that a person of normal length, who seizes the pipe approximately at the transition to the hose, can vacuum clean open areas in an essentially upright position.

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If, on the contrary, the person in question would try to vacuum clean under beds and chests of drawers by means of conventional equipment, the person in question has to crouch strongly and even go down on the knees, which is experienced as very troublesome.

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From the applicant's swedish patent application SE 9801497-0 a flexible joint is previously known, which makes possible an efficient and comfortable handling when used for instance in a piping of a vacuum cleaner. By means of this flexible joint an efficient vacuum cleaning is made possible not only on open areas but also on areas which are difficult to get at, such as for instance under beds and chests of drawers. Furthermore, the vacuum cleaning on top of cupboards and the like is facilitated.

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OBJECT OF THE INVENTION

The present invention relates to a further development of a flexible joint of the type previously known from said SE 9801497-0, and aims at achieving an improved safety during the handling of a device provided with such a joint.

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SUMMARY OF THE INVENTION

20 The object of the invention is achieved by means of a flexible joint having the features defined in claim 1 and claim 2, respectively. By the application of a flexible envelop on the outside of the ball joints included in the joint, a person handling a device, for instance a vacuum cleaner, provided with the joint is in an efficient manner prevented from getting jammed between the ball joints with a body part or an article of clothing when bending the joint.

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According to a preferred embodiment of the invention, the envelope is impermeable to gas. This is most advantageous when the joint is arranged in the piping of a vacuum cleaner, in which case air is prevented from escaping from or penetrating into said piping via the flexible joint. In this way, the suction ability of the vacuum cleaner will not be negatively affected due to an air exchange via the joint.

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According to a further preferred embodiment of the invention, the envelope is impermeable to liquid. In this way, the joint is suitable for use in pipings carrying liquid, for instance in the field of medical treatment.

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According to a further preferred embodiment of the invention, the joint is in its longitudinal direction provided with elongated elements, which are designed to be bendable in the bending direction of the joint but essentially not bendable in a direction perpendicular to said bending direction. In this way an improved stability of the joint is obtained. Elongated elements of said kind can with advantage be attached to the envelope.

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BRIEF DESCRIPTION OF THE DRAWINGS

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The invention will hereinbelow be more closely described with reference to the annexed drawings, where:

Fig 1 shows an embodiment of the pipe joint according to the invention in a bent state,

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Fig 2 shows the pipe joint according to fig 1 in straight state,

Fig 3 shows a ball joint included in the pipe joint according to fig 1 and fig 2, and

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Fig 4 shows, in a schematical illustration, the extension in circumferential direction of a stop lug included in the ball joint according to fig 3.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

The pipe joint shown in fig 1 and 2 is according to the example intended to be placed between two pipings, one of which being indicated with the reference sign 1 and the other with the refer-

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ence sign 21. The pipe joint has, according to this embodiment, five co-operating ball joints 2-6, four of which 3-6 being essentially identical. Each identical ball joint 3-6 (see also fig 3) comprises a first 7 and a second 8 part. The first part 7 essentially
5 consists of a circular cylindrical pipe section, which passes on into the second part 8, which essentially has a modified ball-shape with a throughgoing hole 9 at its centre, the modified ball being able to be regarded as truncated at two diametrically opposed sections, which sections are passed by the cavity 9. For
10 the second, rounded part 8 of the ball joint 3-6 to smoothly and easily fit into the first part 7 of the subsequent ball joint, the cavity 10 in said first part does not have a circular cylindrical shape, but rounded recesses 11 are provided in the cavity 10 in the first part 7 of each ball joint 3-6.

15 At the rear, lower section of the first part 7, a stop lug is arranged. This stop lug 14 extends a distance in the circumferential direction of the ball joint. Preferably, the stop lug 14 has an extension corresponding to an arc with a central angle β of approximately 90° , as illustrated in fig 4, but the stop lug 14 can
20 have a larger as well as a smaller extension than that.

The first ball joint 2 has in principle the same designed as the ball joints 3-6. The only difference is that the first part 12 of the
25 ball joint has a longer circular cylindrical section than the corresponding section of the ball joints 3-6. The purpose of this is to obtain a better adaption of the ball joint 2 to the associated piping 21.

30 The pipe joint is provided with means for preventing the ball joints 2-6 from rotating in relation to each other about the centre axis 22 of the joint. In the embodiment shown in fig 1 and 2, these means consist of pins 23. The respective pin 23 engages into an outer recess of the second part 8 of a ball joint and into
35 an inner recess of the first part 7 of the adjacent ball joint. The pins are in pairs connecting two adjacent ball joints to each

other and the two pins in the respective pair are arranged at opposite sides of these adjacent ball joints. The pins and the recesses are so arranged that two adjacent ball joints can be angled in relation to each other by mutual pivotation about an axis of pivotation 24 extending through two co-operating pins 23, at the same time as the adjacent ball joints are prevented from rotating in relation to each other about the centre axis 22 of the joint. The pins and the recesses are also so arranged that two adjacent ball joints are prevented from being pivoted in relation to each other about axes forming an angle with said axis of pivotation 24. In this way the pipe joint can, with the position shown in fig 2 as starting-point, only be bent upwards as illustrated in fig 1 and not in the cross direction. It is of course also possible to achieve the corresponding function in other ways than with pins and recesses as here described, the second part 8 of the respective ball joint can for instance be provided with an outer protruding section arranged to engage with an inner recess of the first part 7 of the adjacent ball joint or vice versa.

In the position occupied by the pipe joint in fig 2, i.e. in a straight position, there is an open space 13 between the rear, upper section of the first part 7 of a ball joint and the four, upper section of the first part 7 of the adjacent ball joint. This space can, as illustrated in fig 1, efficiently be used for bending of the ball joint. It should be realised that the angle α can be made larger with increasing number of ball joints of the type shown. With the design given to the pipe joint according to this embodiment, the pipe joint can not be bent downwards in a diametrically opposed direction as compared to the upward directed bending according to fig 1, because the stop lug 14 at the rear, lower section of the first part 7 of a ball joint and the four, lower section of the first part 7 of the adjacent ball joint about against each other down in the lower part (see reference sign 17 in fig 2).

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The described design of the ball joint implies that, under the assumption that said pipe joint is arranged on the piping of a vacuum cleaner, by turning the pipe joint in relation to the pipe part 21 approximately 180° starting out from the position of the pipe joint shown in fig 1, a completely straight pipe joint is obtained, which makes possible and efficient vacuum cleaning on open areas. The pipe joint and said pipe part 21 are suitably provided with a snap-in mechanism, schematically indicated at 25, which is adapted to releasably lock the ball joint 2 to the pipe part 21 in two different positions as regards mutual rotation, the ball joint 2 being turnable 180° relative to the pipe part 21 between these positions.

In fig 1 and 2 a locking sleeve 16 is also shown, which according to this embodiment is easily displaceable forwards and backwards in relation to the ball joints, the displacement taking place inside the ball joints. The locking sleeve 16 does in the here shown embodiment constitute an end section on one 1 of the pipings that are connected together via the pipe joint, a locking of the pipe joint taking place by displacing the pipings 1 and 21 towards each other. The locking sleeve 16 preferably has a bevelled or tapered fore section 20 in order to facilitate the insertion thereof into the ball joints 3-6. In fig 2 the locking sleeve 16 is shown fully inserted, which implies that all ball joints are locked in relation to each other so that they are prevented from being angled in relation to each other, which in its turn implies that the pipe joint is essentially straight. In fig 1 the locking sleeve 16 is fully pulled out, which implies that none of the ball joints are locked in relation to each other.

By means of this locking sleeve 16 it is consequently easy to change the value of the angle α from zero and upwards, the change taking place stepwise. The size of the change of the angle is dependent partly on the size of the space 13 between the first parts of two adjacent ball joints and partly on the number of ball joints.

According to the invention, the joint is provided with an outer, flexible envelop 18, which is applied on the outside of the ball joints 2-6 and arranged to cover at least the areas between these so as to eliminate the risk of a person handling a device, for instance a vacuum cleaner, provided with the joint getting jammed between the ball joints with a body part or an article of clothing when bending the joint. The envelop 18 is to have such a flexibility that it can easily be bent together with the joint so that the bendability of the joint in the intended bending direction remains good also when the envelop 18 surrounds the joint. The envelope is suitably made of rubber or plastic material. The envelope 18 preferably consists of a hose-shaped element completely covering the joint.

If the joint according to the invention is intended to be included in a piping for air or any other gaseous medium, for instance in the suction pipe to a vacuum cleaner, the envelop is suitably made of a material essentially impermeable to gas and arranged so as to gas sealingly cover the areas between the ball joints 2-6. It is realised that the envelop 18 in this case suitably consists of a hose-shaped element which covers all the ball joints 2-6 all around these and which is attached at the respective end of the joint in a gas sealingly manner, for instance by means of suitable fastening devices or an adhesive agent such as glue or the like.

If the joint according to the invention is intended to be included in a piping for water or any other liquid medium, the envelop 18 is in a corresponding manner suitably made of a material essentially impermeable to liquid and arranged so as to sealingly cover the areas between the ball joints 2-6.

So as not to negatively influence the bendability of the joint, the envelop can be provided with transverse weakenings or folding notches in the section of the envelop that is intended to abut

against the previously mentioned upper sections (seen in the position of the joint shown in fig 1 and 2) of the ball joints.

5 According to a particularly preferred embodiment of the invention, the joint is in its longitudinal direction provided with elongated elements, not shown, which are designed to be bendable in the bending direction of the joint but essentially not bendable in a direction perpendicular to said bending direction. In this way, an improved stability of the joint is obtained. These elements can for instance consist of thread-like members, which by
10 stamping have been provided with folding notches on suitable locations along its extension. So as not to negatively influence the bendability of the joint, these elements should only be applied at the sections of the ball joints 2-6 which constitute side sections in relation to previously mentioned upper and lower
15 sections, i.e. not at the sections of the ball joints that are turned essentially towards the bending direction of the joint. The elements can be attached along the ball joints 2-6 for instance by being embedded in these. Even though these elements, consequently, can be attached directly to the ball joints 2-6, it is preferred that they are instead applied on or in the envelope, since
20 this implies a more simple construction of the joint.

25 The envelop 18 can advantageously be made of a transparent material so that the ball joints 2-6 included in the joint are visible also when they are covered by the envelop 18.

The joint is made of a suitable material, for instance metal, plastic material or a combination thereof.

30 The invention is of course not limited to the shown and described embodiments, it can only on the contrary be modified within the scope of the subsequent claims. Consequently, this invention could be used in various fields and for various products. One example could be the shaft of a cleaning mop. In that
35 case, the joint should be placed between two parts of the shaft.

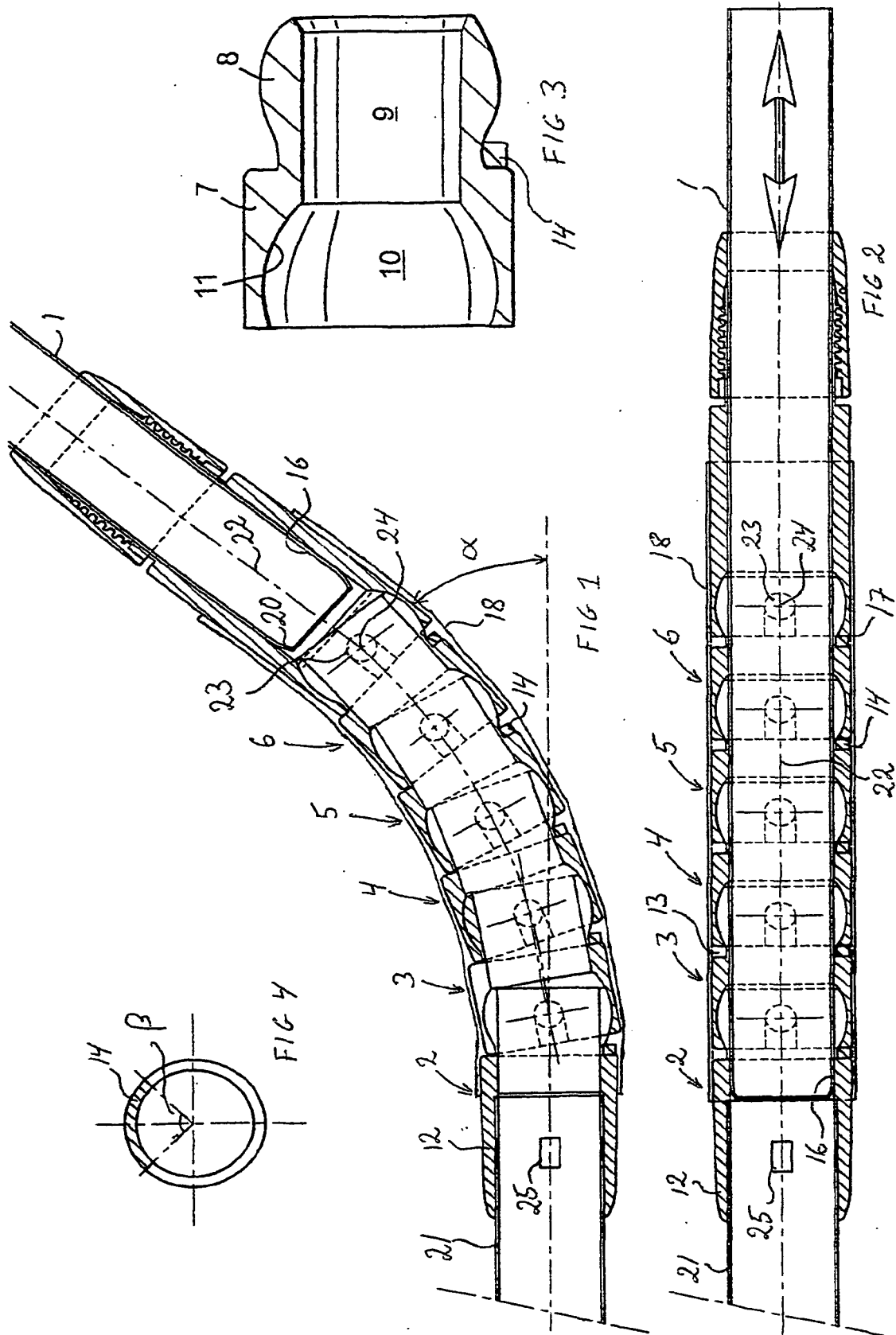
Furthermore, it is of no importance if the parts connected by the joints are hollow or massive.

Claims

1. A flexible joint intended to connect two parts with each other, the connected parts might be rigid, of hose type or a combination thereof and are for instance of the pipe type used in vacuum cleaners, in which case the joint is intended to be placed between the rigid pipe member that is connected to the nozzle of the vacuum cleaner and the hose that is connected to the vacuum cleaner machine itself, which joint comprises:
- a plurality of ball joints (3-6), which co-operate with each other and which make possible for the joint to bend from a position, where the ball joints are not angled in relation to each other and the joint consequently has an essentially straight-lined centre axis, to positions, where the ball joints are angled in relation to each other and the joint consequently has a curved centre axis, and
 - a member (16), which is displaceable inside the ball joints (3-6) to different positions in relation to these, said member being able to go into engagement with and lock one or several of the ball joints (3-6) so as to prevent these from being placed in angled positions in relation to each other, the joint being characterized in that a flexible envelop (18) is applied on the outside of the ball joints (3-6), which envelop (18) is arranged to cover the areas between the ball joints (3-6).
2. A flexible joint intended to connect two parts with each other, the connected parts might be rigid, of hose type or a combination thereof and are for instance of the pipe type used in vacuum cleaners, in which case the joint is intended to be placed between the rigid pipe member that is connected to the nozzle of the vacuum cleaner and the hose that is connected to the vacuum cleaner machine itself, which joint comprises:

- 5 - a plurality of ball joints (3-6), which co-operate with each other and which each comprises a first, essentially circular cylindrical section (7), which passes into a second section (8) having a modified ball-shape, the ball joints being designed in such a way that, when two adjacent ball joints are placed in a straight position, there is a space (13) in a first area between the two adjacent ball joints, which makes possible a bending of the joint in a first direction, and the ball joints further being designed so that two adjacent ball joints, when they are located in a straight position, will be in contact with each other in a second area (17), located at the opposite side of the joint in relation to said first area, whereby a bending of the joint in a second direction, diametrically opposed to the first direction, is prevented, and
- 10 - a member (16), which is displaceable inside the ball joints (3-6) to different positions in relation to these, said member being able to go into engagement with and lock one or several of the ball joints (3-6) so as to prevent these from being placed in angled positions in relation to each other,
- 15 the joint being characterized in that a flexible envelop (18) is applied on the outside of the ball joints (3-6), which envelop (18) is arranged to cover the areas between the ball joints (3-6).
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- 25 3. A joint according to claim 2, characterized in that the respective ball joint (3-6) is provided with a stop member (14), which is arranged in such a way that two adjacent ball joints, when they are located in a straight position, will be in contact with each other in said second area (17) via the stop member (14) of one of the ball joints.
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4. A joint according to any of the preceding claims, characterized in that the envelope (18) is essentially impermeable to gas.
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5. A joint according to any of the preceding claims, characterized in that the envelope (18) is essentially impermeable to liquid.
- 5 6. A joint according to any of the preceding claims, characterized in that the envelope (18) is transparent.
7. A joint according to any of the preceding claims, characterized in that the joint in its longitudinal direction is provided with elongated elements, which are designed to be bendable in the bending direction of the joint but essentially not bendable in a direction perpendicular to said bending direction.
- 10 8. A joint according to claim 7, characterized in that elongated elements are attached to the envelope (18).
9. A joint according to claim 7 or 8, characterized in that the elongated elements are provided with bending notches.
- 15 10. A joint according to claim 9, characterized in that the bending notches of the elongated elements are achieved by stamping.
- 20 11. A joint according to any of the preceding claims, characterized in that the envelope (18) in its cross-direction is provided with weakenings or folding notches for facilitating the bending of the joint.
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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A47L 9/24, F16L 11/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A47L, F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0788759 A2 (DUAL-VOLTAGE CO. LTD.), 13 August 1997 (13.08.97), column 3, line 25 - line 44, figure 1 --	1,2
A	SE 9600650 A (R. VIKSTRÖM), 23 August 1997 (23.08.97), figures 1-5, details 2,6 --	1,2
P,A	WO 0065978 A1 (BYSTRÖM, J.), 9 November 2000 (09.11.00), figures 1a-1c, abstract -- -----	1,2

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents

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INTERNATIONAL SEARCH REPORT

information on patent family members

International application N
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